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Construction Program Management -Decision Making and Optimization Techniques for Sewer and Drainage line construction

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Abstract - *Initially we are going to take an Infrastructure project. During construction of any project there are various stages and various systematic approaches are adopted by the project manager for the benefit of the project. Here we are dealing with sewer and Drainage line construction. From initial to final stage of life cycle of the project various difficulties and problems arises in the project execution. Also for an sewer and drainage line construction strata of soil identifies the way of execution for foundation work the strata may be hard strata which takes more time for completion of foundation and if the strata is soft strata then it will take an sorter span of completion of foundation work . Also if the excavated area is water logged then its become more difficult to execute and will reduce the time of excavation work which leads to delay in project completion. Other beriations like crossing of service line, barrier like owned property, position of man hole can also increase the completion time of the project and also may cause in temporary hold of the execution of work until the issue is closed*

Key Words: **Infrastructure project, life cycle, strata, berrier, completion time**.

1.INTRODUCTION

There are several reasons why the construction industry suffers from low productivity. For example, the construction process is very fragmented, where many actors with different disciplines are involved. Each actor is responsible for a specific part of the project and tends to focus on their own interest, rather than making the final product the best possible.

Another important reason for low productivity is that a construction site has many impact variables, e.g. E.g. Different weather conditions, different locations on site, different material delivery times, different stock sizes, different models and different working conditions. These variables make planning a construction project much more complicated than planning, for example, an assembly line in a car factory where every day is the same.

So what can be done to make the construction industry more efficient? It is generally accepted that the lack of proper planning is one of the main reasons for poor project execution. Today, it is complicated and time consuming in many planning programs to take into account any uncertainties or disruptions that occur during a construction project. Traditional planning methods and tools do not fully support the planning engineer in managing these complexities. Therefore, better project planning tools are needed to make it easier for the user to create better plans with greater accuracy.

Simulation is a powerful tool for analyzing and designing complex systems. It allows you to explore alternative methods or test new ideas in advance for a fraction of the cost compared to testing ideas.

A optimization may include complex relationships between activities that specifically consider resource use and uncertainty, such as variable weather conditions or random machine failures. Today, discrete event simulation is a common tool that supports decision making in the manufacturing industry. In the construction industry, the use of discrete event simulation has been limited to research projects, although the technique has been shown to shorten design cycles, reduce costs and improve knowledge in the construction industry. However, in order to put the technique into practice, the tools must be easy to use.

1.1 Need of study

Decision making for an activity is being used in construction to get an optimized solution is an important procedure for getting an end results in various important factors which effect the project .

This project study will ease the different factors which effect the construction of Drainage line and storm water drain and find out the optimized solution for difficulties arise while construction activities.

1.2 Literature review

a.) Sustainable Decision making in civil Engineering ,construct ion and Building Technology by Edmundas Kazimieras Zavadskas, Jurgita Antucheviciene (2018).

In this paper the Sustainable decision making in construction, civil engineering and construction technology can be supported by basic scientific advances and multi-criteria decision theories (MCDM). This article aims to take stock of the state of the art with regard to published articles on theoretical methods used to support sustainable assessment and selection processes in construction. The review is limited to articles referred to in the Core Database of the Clarivate Analytical Web of Science Core Collection. Because the emphasis is on multicriteria decision making, its objective is to analyze how articles on MCDM development and applications are distributed by publication period, country and institution, authors and journals.

b) ulticriteria-decision making in yhe sustainability assessment of sewerage pipe systems by Albert de la Fuentea (2016)
The study shows a methodology based on evaluation analysis and several test methods was used in this study to assess the durability of steel and plastic pipes. This process minimizes participation in multiple processes and compares other factors. For this purpose, timber should be defined as a non-distance measure of each structure, using the cost and weight assigned to them. This model was developed and tested by interviewing business leaders and leaders in the Spanish community and asking questions. This model is used to measure the durability of eight variants, including reinforced concrete and reinforced concrete and flexible pipes made of polypropylene, polyethylene, polyvinyl chloride and fiberglass-reinforced polyesters. Nominal articles of 400, 800, 1200 and 2000 were selected to represent urban and rural canals
c) A Decision Making System for Construction Temporary Facilities Layout Planning in Large –Scale Construction Projects by Xiaoling Song (2017)
In this research the design of temporary care facilities (CTFLP) requires the establishment of temporary accommodation facilities (CTFs), training sites and CTFs in the training area. This study provides guidance on how to determine the effectiveness of CTFLP in large development projects to improve reliability and efficiency. The system includes import equipment, CTF and candidate analysis, quality determination, inspection and completion of the selection and delivery phase. Wrong conditions are used to resolve differences in the real situation.
d) A novel multi criteria decision making for optimizing time –cost-quality trade- off problems in construction projects by Shahryar Monghasemi (2015)

This paper described the planning phase of each construction project involves several and sometimes conflicting criteria, which must be optimized at once. Multi-scale decision-making processes (MCDMs) help decision makers in selecting the appropriate solution from a number of appropriate solutions. The 'Evidence Region' (ER) approach was first used in project planning to identify the best Pareto solution to personal cost quality balancing problems (DTCQTP). An integrated system for the synthesis of MCDM methods using multi-measure optimization methods has also been proposed.

e) Optimizing decision in advanced manufacturing of prefabricated products: Theorizing supply chain configurations in off –site construction by Mehrdad Arshpoura (2017)

This paper focus on Determining the stability of a material is very important for the production of high quality pre-made products. Previous research has focused on reducing the high cost of external network sites in decision making. However, decisive processes such as strategies that some vendors prefer to add or remove and use multi-vendor configurations have not yet been developed and evaluated. Optional models are designed to improve plant performance with minimal investment.

2. METHODOLOGY

Different data collection methods and source of data . for this project is collected from a construction site “Godavari Riverfront Development Civil works includes Storm Water Drain, Sewer Lines and Water Lines in ABD area under Nashik Smart City Mission, Nashik (Maharashtra). Located at Panchavati Nashik, Maharshtara, India. This storm water drain and sewer line project 550 m length of strom water line and 2.4 km RCC main sewer lines passing through the vicinity of river.

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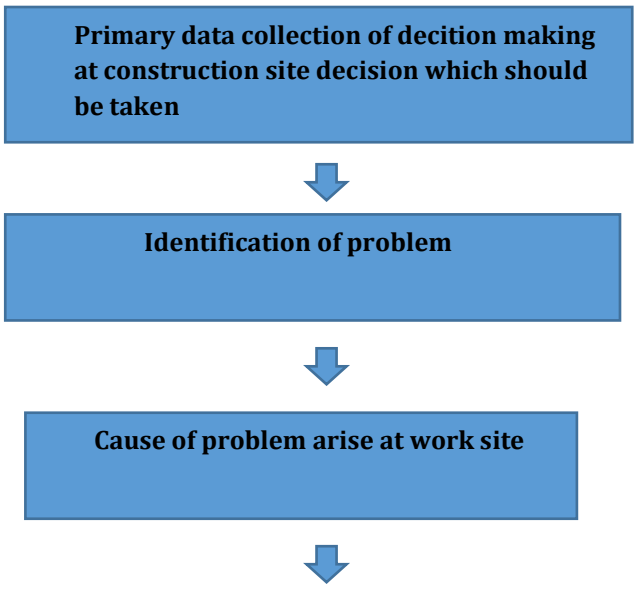

Remidial activity of that problem

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Overcome from that problem

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Overall analysis and conclusion

3. Activities of implementations

3.1 Hard strata

A. Cause of hard strata

Excavation of works takes time due to hard strata

Expected completion time exceeds due to unbreakable hard strata for small patch

Side cutting for required dimension take more completion time.

Vibration to the adjacent existing structure cracks are developed

Quantity of excavation is very less as compare to man and machinery deployed

Excavation at night time is not permitted due to sound problem

Public gathering observed due to traffic diversions

Possibility of accident and casualty due to long period for excavation time in hard strata

More chances of breakage of existing chamber and drainage line due to vibration, casting work and execution work.

Percolation of adjacent water level due to development of cracks at excavated area.

Only skilled operator and labour required for excavation and other allined work.

B Remedial activity due to Hard strata

New techniques and technology to be deployed.

New and advanced equipment's to be used.

Skilled labour to be deployed during operations.

Proper survey to be carried out before the execution of site work.

Prior edge cutting of hard strata to be done to prevent transfer of cracks and vibration and to prevent excess area of cutting.

3.2 Crossing of Drainage line and other services

A. Cause due to crossing of drainage line and other services

Existing drainage line having different invert level creates problem.

Existing high tension line crossing can cause difficulty in execution.

Percolation of water from existing drainage line during execution.

At populated area drinking water line can cause problem in normal water supply due to breakage.

Power cut to an effected area may cause due to breakdown in electric line.

B. Remedial activity of crossing of drainage line and other services

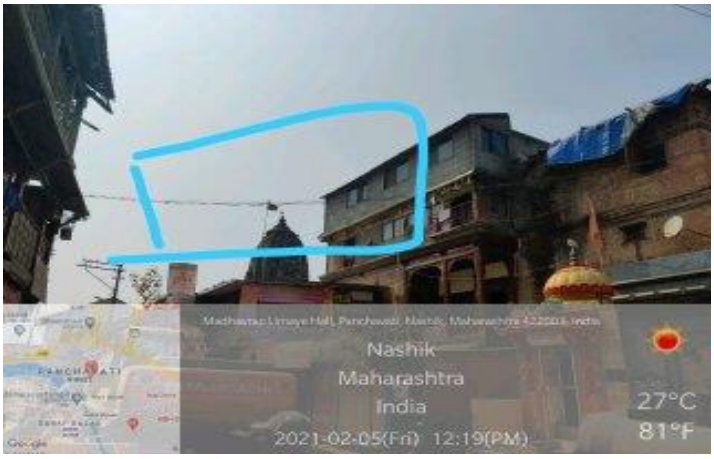
Proper care to be taken during excavation of soft strata at services crossing.

If any breakage observed in any existing line it should be repaired as early as possible to restore the the services.

Proper diversion of existing line to be ensure to do the crossing the line at that position of crossing.

Proper encasing to be provided at the exposed are of HT line .crossing at the excavation site after completion of laying work during backfilling.

Proper connection of sub main line to the main line to be done after laying of main pipe line



3.3 Waterlogged area

A. Cause of water logged area.

Water logging at excavated area increase with the depth of excavation.

Also due to percolation of adjacent water table rapture due to excavated work

Also due to breakage of existing drainage line at crossing or near vicinity of the excavated area.

Due to breakage or replace in existing drinking water supply line or over flow line

B. Remedial activity of water logged area.

Advanced and high discharged head pump are to be used for dewatering.

Sump of more depth then that of excavated level to be done for dewatering of water.

Proper touchep to close the breakage area of reptured existing drainage line to be done to reduced water seepage.

Proper diversion at long distance of water to be done so that it should not come return back to water logged area during dewatering.

Experienced non technical staff to be deployed for arrangementand dewatering work

3.4 Soft strata

A. Cause of soft strata.

Soft strata at an water logged area can create problem for excavation work.

Provision for the movement of machine become difficult at the vicinity of trunch.

Settelment of the soft strata become an major issue wnen it is come in contact of water table.

Laying of foundation for pipe line work become difficult when the hard strata is not at shallow depth than the required level .

Under ground services if their at the excavation area can be easily damaged while excavation.

There is possibility of damage of the work done if new structure is to be executed in future adjacent to the previous existing structure.

B. Remedial activity of soft strata.

Proper and firm base for approach to the working site to be made for proper execution of work.

The excavation done in soft strata should be taper in angle or in steps to prevent the sliding of the soft strsta at the adjacent of the excavation.

New advance machine which have long boom or to convey the concrete from approach area to the casting site to be used.

Experienced technical and non-technical staff should be deployed for the execution of work at site.

3.5 Position of man hole

A. Cause of position of man hole with site condition.

The man hole for an pipe laying work should be 30 mts as standerd but due to site condition it may varies in length than the standard length given.

The man hole is to be taken when there is turning in allingment more than 30 degree.

The man hole more than 30 mtrs have an maintainance problem in future.

The man hole position is very important if the man hole have finish level above at the vicinity of an river.

B. Remedial activity for position of man hole with site condition

The man hole should be at required distance or as per design of the consultant.

If there is no space to provide man hole at required length specified by consultant then max length of manhole to be provided such as it can be cleaned and maintained in future.

4. Analysis and Result

After collecting data required to evaluate the normal activities and critical activity for the execution of different length of proposed pipe line to be laid at different strata and hidden obstacles in the alignment of the pipe line. data are deployed to study and to conclude the results.

Table 4.1: Critical activities for soft strata

Sr. No	Activity
1	Record of OGL
2	Excavation of pipe trench
3	Soling
4	Pcc
5	Hume pipe laying
6	Shuttering for encasing
7	Casting for encasing
8	BBM work for chamber
9	Plaster for chamber
10	Chamber bottom channeling
11	Fixing of manhole cover

Table 4.2: Critical activities for hard strata

Sr. No	Activity
1	Record of OGL
2	Excavation of pipe trench
3	Soling
4	Pcc
5	Hume pipe laying
6	Shuttering for encasing
7	Casting for encasing
8	RCC work for chamber
9	Chamber bottom channeling
10	Fixing of manhole cover

5. Conclutions

Various literature on the decision making and optimization techniques for different projects has been studied and is find out that optimization of any part of the project can be carried out by changing the decision involve in the execution. To find out the optimal solution of RCC hume pipe laying work the steps involved in execution of pipe laying is deeply monitored and required data for optimization is collected. The required data for the project has been collected from Godavari River front development Project under Nashik Smart City and is used as the input data for the project.

Strata is become an key factor for the execution of the pipe line project . At hard strata increase all alined factor while execution which can be reduced and optimized by new techniques viz, Diamond cutter method which optimized the work execution in all involved factor.

At soft strata proper planning and approach road at work site will give proper and effective completion of project

Other berrieation on execution of pipe line laying work can be done minimal by getting proper information of the area where the project to be executed.

The optimized method will be useful to deliver the project on time and reduced the risk of delay and overruns by developing optimized schedule.

After comparison of time taken for different length of soft strata it is conclude that the time consumption of the alined work can be completed in shorter than scheduled time by deploying skilled labour , experienced staff and proper planning.

Also with the comparison of labor deployed for the scheduled activities can be reduced when the activity is completed before planned time.

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